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Expressive Verb morphology deficits in Arabic-speaking children with Developmental Language Disorder

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Abstract

Purpose

This study investigated the production of tense and subject-verb agreement in Palestinian Arabic-speaking children with Developmental Language Disorder (DLD) in comparison to their typically developing peers (TD) in terms of (1) performance accuracy and (2) error patterns.

Method

Participants were 14 children with DLD aged 4;0 - 7;10 (years; months) and 32 TD children aged 3;0-8;0 (years; months) matched on non-verbal abilities. Children were asked to complete a picture-based verb elicitation task. The task was designed to measure the production accuracy of tense and subject-verb agreement inflections in Arabic.

Results

The DLD group scored significantly lower than the TD group on the verb elicitation task. The DLD group was significantly less accurate than the TD group in marking tense, specifically present tense. They were also less accurate in marking agreement in general, with specific difficulty in using feminine verb forms. The DLD and TD groups differed in their tense error patterns, but not in agreement error patterns.

Conclusion

The acquisition of verb morphology in Palestinian Arabic-speaking children with DLD appears to be delayed and possibly different from their TD peers. The DLD group found the production of marked verb forms more challenging than less marked ones. These results are discussed in light of the structural characteristics of Arabic. Future studies would need to include larger sample sizes, investigate other aspects of verb morphology, including both production and comprehension, include other language domains, and consider longitudinal designs to provide more in-depth knowledge of Arabic language acquisition.

Introduction

Children with *Developmental Language Disorder* (DLD) exhibit morpho-syntactic deficits often related to the use of tense and subject-verb agreement inflections (for a review, see Leonard, 2014). Production of verb inflections, such as past tense *-ed*, present third-person singular *-s*, auxiliary and copula *be* and auxiliary *do* forms have been reported as problematic for English-speaking children with DLD (e.g., Leonard & Kueser, 2019; Rice & Wexler, 1996) and verb morphology difficulties are considered to be a clinical marker of DLD in English (e.g., Bedore & Leonard, 1998; Conti-Ramsden, Botting, & Faragher, 2001).

Cross-linguistic research shows that verb morphology is differentially impaired across languages. For example, children with DLD acquiring Germanic languages are reported to be less accurate than their typically developing (TD) peers in marking tense and agreement, and especially past tense marking (Krok & Leonard, 2015), yet their accuracy of using verb inflections is higher than that reported for English-speaking children with DLD (for a review, see Leonard, 2014). For children with DLD acquiring Romance languages, such as Spanish and Italian, verb morphology is not as problematic; the main difficulties seem to be using function words, such as articles, and unstressed direct object pronouns (e.g., Bedore & Leonard, 2001; Bortolini, Caselli, & Leonard, 1997). Hebrew-speaking children with DLD have difficulties marking agreement in past tense, but not marking present tense (e.g., Dromi, Leonard, Adam, & Zadunaisky-Ehrlich, 1999; Leonard & Dromi, 1994).

In summary, verb morphology deficits vary between languages, especially when languages are typologically different. Therefore, studies of grammatical morphology should be language-specific. The present study aims to extend this line of research by characterizing verb morphology deficits in children with DLD acquiring Palestinian Arabic (PA).

Palestinian Arabic Verb Paradigm

In the Arab world, Modern Standard Arabic (MSA) is the language of literacy tasks and is used in formal contexts, such as news. A unique feature of the Arabic language is diglossia (Haeri, 2000). Each Arab country has a distinctive dialect of Arabic that is used for everyday social interactions. This paper focuses on the colloquial dialect of Palestine: Palestinian Arabic (PA). MSA and its dialectal varieties are characterized by their nonconcatenating templatic morphology that is based on a system of *roots* and *patterns* (McCarthy & Prince, 1988; Ryding, 2005). The *root* is an invariable sequence of three to five consonants and it carries lexical meaning. The *pattern* consists of one or more vowels and it carries grammatical meaning. Patterns (vocalic infixes) are discontinuously inserted within the consonantal root to form words and stems (Tucker, 2011). In PA, for example, the root *drs* denotes a meaning of “studying”. By shifting different patterns and consonantal affixes around this root we can derive different words such as *daras* “he studied”, *madrassa* “school” or *dars* “lesson”. MSA is null-subject language and verbs are conjugated to represent different grammatical categories including tense and aspect (past/present and perfective/imperfective), number (singular, dual and plural), person (first, second and third), gender (masculine and feminine), mood (indicative, subjunctive, jussive, energetic and imperative) and voice (passive/active; Benmamoun, 2000).

Three verb forms are distinguished by traditional Arabic grammarians: perfective, imperfective and the imperative verbs. There is debate of whether Arabic verbs are considered to be tense-specific where perfective and imperfective verbs refer to past and non-past actions, respectively; or aspect-specific where perfective and imperfective verbs refer to complete or non-complete actions (for a review, see Ouali, 2018). According to Ouali (2018), there seems to be a consensus in recent literature that Arabic is tense language. Table 1 presents the verb paradigm in PA.

Table 1. *Verb paradigm in Palestinian Arabic for the root d-r-s (studying)*

Person	Number	Gender	Past tense			Present tense			Imperative		
			Form	Affixes	Verb +	Form	Affixes	Verb +	Form	Affixes	Verb +
			Affixes			Affixes			Affixes		
1	Singular	neutral*	1	-it	<i>darasit</i>	9	<i>b-a-</i>	<i>badrus</i>			
1	Plural	neutral	2	-na	<i>darasna</i>	10	<i>b-ni-</i>	<i>bnidrus</i>			
2	Singular	Masculine	3	-it	<i>darasit</i>	11	<i>b-ti-</i>	<i>btidrus</i>	17	<i>ʔi-</i>	<i>ʔidrus</i>
2	Singular	Feminine	4	-ti	<i>darasti</i>	12	<i>b-ti--i</i>	<i>btidrusi</i>	18	<i>ʔi--i</i>	<i>ʔidrusi</i>
2	Plural	neutral	5	-tu	<i>darastu</i>	13	<i>b-ti--u</i>	<i>btidrusu</i>	19	<i>ʔi--u</i>	<i>ʔidrusu</i>
3	Singular	Masculine	6	∅	<i>daras</i>	14	<i>b-yi-</i>	<i>byidrus</i>			
3	Singular	Feminine	7	-at	<i>darsat</i>	15	<i>b-ti-</i>	<i>btidrus</i>			
3	Plural	neutral	8	-u	<i>darasu</i>	16	<i>b-yi--u</i>	<i>byidrusu</i>			

Note. *The gender category “neutral” indicates that the affix attached to the verb has no gender distinction.

Past Tense

In PA, the perfective verb is used to refer to past and completed actions (Abu-Ghazaleh, 1983, p.125), will be referred to as past tense. Past tense is an abstract morpheme, i.e. not realized by an overt affix (Benmamoun, 2000). The past tense verb consists of a stem *daras* (root + vocalic infixes) and takes only suffixes which denote subject-verb agreement (Benmamoun, 2000). The suffix is a discontinuous unit which simultaneously reflects agreement for person, gender and number. For example, the suffix *-ti* in *darasti* “you studied” denotes agreement for a 2nd person feminine singular subject (form 4, Table 1). The 3rd person masculine singular *daras* “he studied” is unmarked, i.e. it does not take any suffixes (form 6, Table 1). It is homonymous with the past tense verb stem. It is important to note here that unlike MSA, PA verb paradigm is smaller as the subject-verb number agreement has no dual category and the plural agreement suffix *-u* has no gender distinction (e.g., forms 8, 16 and 19 in Table 1; Jarrar et al., 2014).

Present tense

The imperfective verb is used to refer to an ongoing activity which could be in the present, past or the future time (Benmamoun, 2000). In PA, the imperfective verb has three moods: indicative, subjunctive and imperative (Abu-Ghazaleh, 1983; Shahin, 2007). In this section, we focus on its indicative mood which occurs in sentences with present tense interpretation (henceforth, present tense).

The present tense is composed of a stem *drus* (root + vocalic affix) with its subject-verb agreement being realized by a prefix or a combination of a prefix and a suffix (circumfix morpheme). In the PA present tense verb, the temporal information is carried by the present progressive clitic *b-*, which attaches to the prefix (Abu-Ghazaleh, 1983; Jarrar et al., 2014; Shahin, 2007). Person agreement is mainly realized by the prefix. Gender is also realized by the prefix, except for the 2nd person singular feminine where gender is expressed by the suffix

-i (form 12, Table 1). Plural number agreement is realized by the suffix *-u* except for the 1st person where the number is realized by the prefix *bni-* (Benmamoun, 2000). More than one subject-verb agreement feature can be realized by one prefix. For instance, the prefix *byi-* in *byid.rus* “he is studying” indicates a 3rd person masculine subject (person and gender agreement). In other instances, the subject-verb agreement features are realized by a circumfix affix, an unanalyzable unit of a prefix and a suffix. An example is the circumfix *byi—u* in *byid.ru.su* “they are studying”, where it denotes 3rd person plural agreement (no gender distinction).

Finally, it is clear that the verb forms we described differ from each other in terms of markedness, i.e. the morphological realization of grammatical categories (e.g., Corbett, 1991, 2000; Leech, 2006). In Arabic subject-verb agreement, contrasts in number agreement (singular versus plural) and gender agreement (masculine versus feminine) are asymmetrical in terms of their morphological realization. Rather, one member of the contrast is overtly coded by an affix and therefore is “marked”, whereas the other member has no overt coding (zero affixes) and is therefore considered as an unmarked form. For example, if we look at the opposition of singular-plural in number agreement, the singular verb is not overtly realized by any affixes (e.g., *daras* “he studied”), whereas, the plural verb is realized by the affix *-u* (e.g., *darasu* “they studied”). The singular verb is therefore considered as the unmarked/default form, while the plural is the marked form. The same applies to gender agreement (only in past tense) where the feminine verb is marked whereas the masculine form is unmarked.

The Imperative

Although the imperative verb has a shared structure with the present tense, the imperative lacks the present progressive clitic *b-* and the initial prefix which indicates person and gender agreement. The imperative only occurs in the second person, yet the person feature is unmarked (Al-Aqarbeh, 2011). Although PA has a prefix for second person present tense verbs

(e.g., *bti-* or *bit-*), this prefix is dropped in the imperative verb. Gender and number agreement of the imperative verb is denoted by the suffix (see forms 17 -19, Table 1).

There is little agreement on whether the default tense form in Arabic. While some researchers argued that the default form is the imperative (Abdallah & Crago, 2008; Morsi, 2009; Omar, 1973; Qasem & Sircar, 2017), others identify it as the imperfective verb stem (Aljenaie, 2010; Benmamoun, 1999). Fahim (2017) stated that the default verb can take more than one form including the imperative, subjunctive or a variant of the imperfective verb stem. The imperative does not have a time reference and it is considered non-finite (Ryding, 2005). Similarly, Benmamoun (2000) states that the imperfective verb occurs in different contexts such as sentences with past, present or future interpretation as well as in embedded non-finite sentences. This evidence clearly shows that the imperfective does not morphologically carry any temporal or aspectual information (Benmamoun, 1999, 2000). Although there are slight morphological differences between the two forms (primarily in their prefixes), they are very similar which could be the cause of inconsistency among studies. By removing the affixes of the imperative (e.g., form 17, Table 1) and imperfective indicative (present tense; e.g., form 11, Table 1), it can be seen that both forms share the same stem, suggesting that the imperative is derived from the imperfective verb (Benmamoun, 1999; Shahin, 2010; Soltan, 2007).

Typical and atypical verb morphology acquisition in Arabic

Few studies have examined typical language acquisition in Arabic. In a longitudinal study, Omar (1973) described the acquisition of phonology, syntax, and morphology in 37 Egyptian Arabic-speaking children aged 6 months to 15 years. The study reported that children started using verbal agreement morphology around the age of 2;3 years. Masculine and singular verbs emerged earlier than feminine and plural verbs, respectively. Omar (1973) further observed

that, in the early stages of verb production, Egyptian Arabic-speaking children predominantly used the singular masculine verb as the default verb agreement category.

In a longitudinal study on PA, Abdu and Abdu (1986) documented the milestones of lexical development of their two children from around the age of one year up until six years. Their data on the acquisition of verbs indicated a certain order in which verb forms emerge in PA. In line with Omar (1973)'s findings on verb agreement, masculine and singular verbs were developed earlier than feminine and plural verbs, respectively. Additionally, 3rd person verbs appeared before 1st person verbs, with 2nd person verbs appearing last. This order was limited to past tense verbs, as no particular order was noted for present tense verbs.

Similar findings are reported by Aljenaie (2001) who followed the development of verb tense and agreement in four Kuwaiti Arabic-speaking children aged 1;17 to 2;6 years for 6 months using spontaneous speech, elicited production and imitation tasks. All four children began using present and past tense verbs at age 2;0 years. However, the order at which these forms emerged in the children's language could not be determined due to the variability in the data. Agreement marking emerged in a developmental pattern: masculine verbs appeared before feminine verbs, singular verbs appeared before plural verbs while 1st person verbs appeared first followed by 3rd person and 2nd person verbs, respectively. Furthermore, Aljenaie (2001) noted that children showed a tendency to use unmarked forms in contexts where verb inflections were required. In past tense contexts, the unmarked form was the 3rd person masculine singular, wherein the present tense context the unmarked form was described as being as either the imperative masculine verb or a form that was homophonous to the stem of the target verb (Aljenaie, 2001). The use of the imperative was also noted in the speech of typically developing Yemini (Qasem & Sircar, 2017) and Egyptian-Arabic-speaking children (Omar, 1973).

In another longitudinal study, Aljenaie (2010) examined spontaneous speech samples of three Kuwaiti Arabic-speaking children aged 1;8 to 3;1 years. An analysis of agreement errors revealed that masculine verbs were used to substitute feminine verbs. These findings suggest that children show a preference for the less marked, more neutral masculine form, over the feminine counterpart, which is strongly and consistently marked by inflections for gender (Aljenaie, 2010, p.852). Regarding tense errors, Kuwaiti Arabic-speaking children used the imperfective bare verb, a non-finite form, in place of fully inflected verbs (Aljenaie, 2001, 2010). This supports the view that the imperfective verb stem is most likely the default tense form in Arabic (Benmamoun, 1999, 2000).

Basaffar and Safi (2012) investigated the developmental patterns of tense and verb agreement in two to four-year-old Hijazi Arabic-speaking children. Using experimental tasks alongside a spontaneous speech analysis, they replicated the findings of verb agreement reported by Aljenaie (2001). Basaffar and Safi (2012) concluded that children produced present and imperative forms with higher accuracy than past and future forms. However, the lack of any reported accuracy levels, statistical analysis, error analysis or clear guidelines for the protocol and scoring of the children's responses limits the generalizability of these results.

Research into morpho-syntactic difficulties in Arabic-speaking children with DLD has been scarce. Drawing on her dissertation data from 2002 (Abdallah, 2002), Abdallah and Crago (2008) analyzed speech samples obtained from Hijazi-Arabic speaking children with DLD 4;0 to 5;3 years of age. Children with DLD were less accurate than their age and language-matched peers in marking tense in general. The DLD group scored significantly higher for past tense than for present tense forms, which suggests that these children's difficulties with tense were more pronounced in present tense verbs. Not all subject-verb agreement categories were problematic for the DLD group. Present tense, feminine and 3rd person verbs, which were structurally more complex were more problematic than unmarked verb forms, such as past

tense and masculine verb forms (Abdallah & Crago, 2008). Importantly, both TD and DLD children used the imperative in place of the target tensed forms. In a few instances, children used an incorrect tense form (e.g., present tense for past tense). When agreement errors occurred, one agreement feature was affected (e.g., third person masculine singular replaced third person feminine singular). Abdallah and Crago (2008) characterized agreement errors as follows: singular verbs were used in place of plural verbs, masculine verbs for feminine verbs and first person verbs for third person verbs.

Morsi (2009) found that Egyptian Arabic-speaking, 6-year old children with DLD were less accurate than their age and language-matched peers in the production of verbal tense and agreement, with tense being more challenging than agreement. Morsi (2009) stated that, for the DLD group, present tense production was more difficult than past tense production, and the imperative was used as the default form when tense errors occurred.

Drawing on her dissertation data from 2005 (Fahim, 2005), Fahim (2017) analyzed spontaneous speech samples of three Egyptian Arabic-speaking children with DLD 3;1 to 4;6 years of age and six TD children aged 1;0 to 4;0 years. She concluded that only subject-verb agreement marking was impaired in Egyptian-speaking children with DLD while tense marking was less affected (based on past tense marking). Furthermore, Fahim (2017) identified three errors patterns that were noted in the speech of children with and without DLD. The first error pattern involved the use of a default verb form in place of the tensed verb. The form was described to resemble the imperative or the subjunctive. The second error pattern involved a verb with the correct tense but incorrect agreement. The third error involved the production of non-adult target forms (pseudowords) in place of the target verbs.

A different pattern of results emerged in Shaalan's (2010) dissertation which reported that Qatari Arabic-speaking children with DLD (aged 4;6 to 9;4 years) were less accurate in producing tense and agreement inflections than TD children. Specifically, past tense was more

problematic than present tense for the DLD group. Shaalan (2010) stressed that these results were preliminary, as they were only based on a few items ($N = 12$) and noted that further research was required.

The results of the Arabic studies have generally determined tense and verb agreement aspects that are challenging for children with DLD. There is little agreement among the studies on which aspect of verb morphology is more problematic for children with DLD: tense or agreement. Also, it is inconclusive what the default form in Arabic is as both the imperative and the imperfective bare verb forms have been suggested. These questions require further investigation. Besides, two other methodological issues may have contributed to different findings. First, low participants numbers ($N = 3$) in Fahim's (2017) and Morsi's (2009) studies, which does not allow for generalization of their results. Second, methodological differences in terms of task used: Abdallah and Crago's (2008) and Fahim's (2017) studies analyzed speech samples, whereas Morsi (2009) and Shaalan (2010) used a structured elicitation task for the target verb inflections. This could have resulted in differences in the number and type of verb inflections included in the analyses.

Aims and Approach

This study aims to extend previous Arabic studies by conducting a systematic investigation of verb morphology use by children with and without DLD acquiring Palestinian Arabic (PA). Determining which verb forms are potential linguistic markers of DLD in PA would inform and enhance the current assessment practices of DLD in Palestine. Furthermore, data from Arabic children with DLD could be used to examine the assumptions of theoretical accounts of DLD and provide insights into possible underlying mechanisms of the disorder.

The present study examined the production of tense and subject-verb agreement in PA-speaking children with DLD as compared with typically developing (TD) children by

investigating: 1) the production accuracy and 2) error patterns of verb tense and agreement marking.

We predict that, compared to TD children, children with DLD will achieve lower overall accuracy on the verb elicitation task. Children with DLD will have more difficulties using marked verb forms compared to less marked ones. Specifically, the use of present tense verbs is expected to be more challenging than past tense verbs (Abdallah & Crago, 2008; Fahim, 2005; Morsi, 2009). Feminine and plural verbs are predicted to be more problematic than masculine and singular verbs forms (Abdallah & Crago, 2008). Children with and without DLD will use the imperative verb (Abdallah & Crago, 2008; Fahim, 2017; Morsi, 2009) or the imperfective bare verb as tense default forms (Aljenaie, 2010; Benmamoun, 1999). Finally, children with and without DLD will use less marked verbs (masculine and singular verbs) as default agreement forms in place of more marked, feminine and plural verbs (Abdallah & Crago, 2008; Aljenaie, 2010).

Methods

Participants

The study was approved by the Research Ethics Committee at [REMOVED FOR REVIEW]. Sixty-four Palestinian Arabic-speaking children were recruited: 14 children with DLD (10 boys), aged between 48 and 94 months with a mean age of 66 months ($SD = 15.47$) and 32 TD children (19 boys), aged between 36 and 96 months with a mean age of 62 months ($SD = 16.88$). The groups did not differ significantly on chronological age ($t(44) = .83, p = .413, d = .27$). The TD and DLD groups were matched on non-verbal cognitive abilities as measured by raw score on the Coloured Progressive Matrices (CPM; Ravens, 2007), as this test is not standardized on PA-speaking children ($t(42) = -.81, p = .423, d = .26, variance\ ratio = 1.11$). Table 2 summarizes the raw scores of the two groups on several background measures. See Appendix 1 for individual scores.

Table 2. A summary of the demographic characteristics, developmental milestones and background measures for the TD and DLD groups

	Group	
	TD N=32	DLD N=14
Demographic characteristics	% (N)	
<i>Mother's education</i>		
Primary school	9.38 (3)	14.29 (2)
High school	31.25 (10)	28.57 (4)
University /college degree	46.87 (15)	35.74 (5)
Postgraduate degree	12.5 (4)	21.43 (3)
<i>Working mother</i>	39.47 (15)	50 (7)
<i>Family history of communication disorders</i>	6.25 (2)	42.56 (6)*
<i>Developmental milestones</i>	<i>Mean(SD)</i>	
<i>Age in months</i>	<i>Range</i>	
<i>First word</i>	12.69 (2.46) 9 - 18	24.64 (6.65)* 15 - 36
<i>Follow simple commands</i>	17.59(3.44) 12 - 24	20.14 (5.95) 12 - 36
<i>walking</i>	12.66(1.45) 10 - 15	12.5(1.7) 10 -16
<i>Background measures</i>	<i>Mean(SD)</i>	
<i>raw scores</i>	<i>Range</i>	
<i>MPU</i>	4.91 (1.24) 2.41 - 7.61	3.58 (1.04)*** 2.19 - 6.27
<i>CL-NWR</i> (out of 30)	26.84 (4.34) 16 - 30	15.57 (4.13)** 9 - 23
<i>CPM</i> (out of 36)	16.67 (4.39) 8 - 23	15.5 (4.62) 9 - 23

Note. TD = Typically Developing. DLD = Developmental Language Disorder. SD = standard deviation. MPU = Mean Morpheme per Utterance. CL-NWR = Cross linguistic Non-word Repetition. CPM = Colored Progressive Matrices.
* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Children with DLD were recruited through four private speech therapy clinics located in [REMOVED FOR REVIEW]. They were previously independently diagnosed with DLD by qualified speech and language therapists (SLTs) who used non-standardized assessment tasks. Based on a screening of clinical reports, all children in this group had primary language deficits, no obvious non-verbal difficulties, used speech as their primary means of communication and had no diagnoses of any speech disorder interfering with intelligibility. All children were receiving language intervention services at the time of the study. The TD control children were recruited through one day-care, two kindergartens and one school in [REMOVED FOR REVIEW] and had no reported history of language delay/impairment and demonstrated age-appropriate language skills as determined by parental/teachers' reports.

Parents completed a questionnaire that included questions about demographics (e.g. maternal education), child's health and general development, language acquisition milestones and family history of language difficulties. The questionnaire was used to ensure that all children were monolingual Arabic speakers and had no evidence or reported history of hearing loss, cognitive and/or neurological impairments, speech motor disorders and diagnoses of other developmental disorders (e.g., Autism). Based on questionnaire results, alongside teacher reports, four children did not meet the eligibility criteria for the TD group and were not tested for the study.

Groups did not differ significantly in maternal education: $\chi^2(3, N = 46) = 1.03, p = .793$. Children with DLD had a significantly higher frequency of family history of communication disorders: $\chi^2(1, N = 46) = 6.72, p < .001$ and produced their first words significantly later: $t(14.57) = 6.53, p < .001, d = 2.39$. See Table 2 for details.

Because the diagnosis of DLD in [REMOVED FOR REVIEW] is based on informal assessments, scores on standardized language assessments were not available. Two non-

standardized tasks were used to verify that children with DLD had language skills that were considerably below the level expected for their chronological age.

1. Spontaneous narratives of 100 utterances were elicited using a wordless picture book “Frog, where are you” (Mayer, 1969) to calculate the Mean Morpheme per Utterance (MPU). MPU is equivalent to the Mean Length of Utterance (MLU; Brown, 1973) in English. MPU is a measure of grammatical development and takes into account the highly synthetic nature and rich morphology of Semitic languages. (Dromi & Berman, 1982). MPU is calculated by dividing the total number of morphemes by the total number of utterances produced in the narrative task. We followed the guidelines of counting Arabic morphemes that were developed by Shaalan and Khater (2006). These guidelines were adapted from the MPU calculation rules in Hebrew (Dromi & Berman, 1982). Previous studies on Arabic (Abdallah & Crago, 2008; Shaalan, 2010) have also used this measure to confirm the presence of developmental language impairment.
2. The Arabic version of a Crosslinguistic Nonword Repetition test (CL-NWR; for a full description see Abi-Aad & Atallah, 2012). The task includes 30 nonwords and was scored using a whole-item approach (correct/incorrect) with the maximum score being 30. The task was found to have potential for the discrimination of L1 learners of Lebanese Arabic with and without DLD (Abi-Aad & Atallah, 2012). The task was also documented to have good diagnostic accuracy in identifying Palestinian children at risk of DLD (Taha & Chondrogianni, 2017).

The mean MPU for the DLD group was significantly lower for the TD group: $t(44) = -3.51$, $p < .001$, $d = 1.23$. Scores of the DLD group were also significantly lower than the TD group on the CL-NWR test: $t(44) = -8.22$, $p < .001$, $d = 2.63$. Norms for these tasks are not established for the Palestinian population. Therefore, mean raw scores are reported (see Table 2).

Verb elicitation task

An elicitation task was developed to test children's production of the following verb forms (1) present masculine singular, (2) present feminine singular, (3) present plural, (4) past masculine singular, (5) past feminine singular, and (6) past plural. The task assessed the production of these morphemes in third person only.

Seventy-two pictures were divided into 30 pairs of experimental items and 12 filler items (singular and plural noun pairs). The experimental items were further categorized into 8 paired items for masculine singular verb forms, 7 paired items for feminine singular verb forms and 15 paired items for plural verb forms. Because present tense inflections vary in stress assignment, 50% of the present tense verbs had a stressed tense prefix and 50% had an unstressed tense prefix (see Appendix 2 for test items).

Each verb was represented by a pair of pictures showing a sequence of events that the child was asked to describe. The first photograph depicted a person or a group performing an activity and the second photograph depicted the same person or group having finished the activity. The test items depicted actions from familiar daily routines. The task was piloted with 10 TD children aged between 40 and 67 months, mean age 58 months ($SD = 9.36$) to ascertain that children of this age could easily identify the verbs in the pictures. Results showed that 96.38% ($SD = 8.21$) of the children were able to correctly name the pictures.

Procedure

Children were assessed individually in a quiet room within their nursery, school or speech and language therapy clinic. All assessments were conducted in one session by the first author (a qualified Arabic-speaking speech-language therapist). Each session lasted approximately 1 hour and was audio-recorded using a Sony ICD-PX370 Digital Voice Recorder. The tasks were administered in the following order: Coloured Progressive Matrices (CPM), narrative task, Crosslinguistic Nonword Repetition Task (CL-NWR), and the verb elicitation task. Four

practice items were given to familiarize the children with the verb elicitation task and items were presented in the same order for all participants. Throughout the task, children received praise for their efforts but were not provided with any feedback about the accuracy of their productions. The examiner pointed at each item and presented the child with a question that created an obligatory context for the use of the target verb inflections in present tense, and past tense as seen in the examples below:

1) Present tense

a. **Researcher:** ish byisawwi il-walad halla ?

What do-PRES-3MS the-boy now?

‘What is the boy doing now’?

b. **Child:** il-walad byiyakul buza

The-boy eat-PRES-3MS ice-cream

‘The boy is eating ice-cream’

2) Past tense

a. **Researcher:** il-walad xallas, ish sawa il-walad?

The-boy finish-PAST-3MS, what do-PAST-3MS the-boy?

What did the boy do yesterday?

b. **Child:** il-walad akal buza

The-child eat-PAST-3MS ice-cream

The child ate ice-cream

Scoring

The children’s responses were transcribed orthographically online and were audio-recorded for further analysis. Children’s productions were scored using three methods:

1. **Whole-item accuracy:** The child’s response was scored as correct if it was in the correct tense and had the correct person, number and gender agreement. That is, the child’s

response should be identical to the target. If the response differed from the target verb in any of these elements (e.g., correct tense, person and number agreement but incorrect gender agreement), it was scored as incorrect. Correct response received a score of 1 while incorrect verbs received a score of zero. The maximum overall score the child could achieve on the task was 60.

2. Tense accuracy: Tense accuracy was determined based on the context of the picture (present vs past). The child's response was scored as correct and received a score of 1 if it matched the target tense, regardless of subject-verb agreement accuracy. In case of an incorrect response, the substitute tense was recorded for further error analysis.

3. Subject-verb agreement accuracy: As described above, subject-verb agreement in Arabic is fusional. Therefore, determining the accuracy of subject-verb agreement is not transparent. Inspection of our data revealed the following: 1) children tended to omit different parts of the same prefix. For instance, 3rd person masculine singular verb *byidrus* "he is studying" would be produced as *yidrus* which is a 3rd person masculine imperfective bare verb or *idrur* a 2nd person masculine imperative verb. 2) Children treated the discontinuous circumfix *byi—u* of the 3rd person plural present tense as separate affixes. Omitting part of the circumfix meant that some but not all of the agreement features of the verb were lost. For example, in the verb *byidrusu* "they are studying", an omission of *-u* will only change number agreement from plural to singular. However, 3rd person agreement will not change since the prefix *byi-* is preserved. To account for this pattern, we followed Abdallah and Crago (2008)'s scoring approach. Each of the agreement features of the child's response (person, number and gender) was checked against the agreement features of the target verb (subject in the picture), irrespective of tense accuracy. Each agreement category was scored as correct or incorrect. Hence, we had three scores: person agreement accuracy, number agreement accuracy and gender agreement accuracy. Errors in each

438 element were recorded for further error analysis. To better illustrate the scoring system,
439 we provide an example below.

	Verb + Affixes	Affixes	Tense	Person	Number	Gender
Target	<i>btidrus</i>	<i>bti-</i>	Present	3rd	Singular	Feminine
Child's production	<i>idrus</i>	<i>i-</i>	Imperative	2nd	Singular	Masculine
Accuracy	Incorrect	Incorrect	Incorrect	incorrect	Correct	Incorrect
Whole-item score	Incorrect					

440 441 **Reliability**

442 The spontaneous speech sample of randomly selected 10 children (21% of the sample) and
443 their responses on the verb elicitation tasks were scored by an independent speech and language
444 therapist to calculate inter-rater reliability. The agreement between the two raters was 100%
445 for the overall score, 98% for tense scores, 100% for gender scores, 100% for number scores,
446 97% for the person scores. The inter-rater agreement for MPU calculations was 87%.

447 **Analysis**

448 Statistical analysis was carried out using R studio software version 3.6.0 (RStudio, 2019).
449 Raw scores were converted to percentages. For each of the tense and agreement accuracy
450 scores, mixed-design ANOVAs were conducted with the target grammatical category as a
451 within-subject variable and group as the between-subject variable. Significance levels
452 were set at $p < .05$. Significant interactions were followed by simple effects analysis.
453 Bonferroni corrections for multiple comparisons were applied (Field, 2009, $p.373$). Type 1
454 error was controlled for by dividing the significance value ($p < .05$) by the number of

comparisons ($n = 4$). Hence, the significance level for all simple effects analysis was $p < .0125$.

Results

Analysis 1: The production accuracy of verb tense and agreement marking

Overall, the DLD group scored significantly lower than the TD group on the verb elicitation task ($t(16.91) = -3.89, p < .001, d = 1.36$). Table 3 summarizes the accuracy of the verb forms examined in the task.

Tense accuracy

Tense accuracy scores were analyzed using a 2 x 2 mixed-design ANOVA with group as a between-subject factor (2 levels: DLD and TD) and verb tense as a within-subject factor (2 levels: past and present). Analysis revealed a significant main effect of group [$F(1, 44) = 22.36, p < .001, \eta^2 = .34$], verb tense [$F(1, 44) = 23.85, p < .001, \eta^2 = .35$]. Also, the group by verb tense interaction was significant [$F(1, 44) = 18.04, p < .001, \eta^2 = .29$].

The TD group were significantly more accurate marking past tense than present tense: $t(31) = 2.79, p < .0125, d = .49$. Similarly, the DLD group was more accurate with past tense marking than present tense marking: $t(13) = 3.97, p < .0125, d = 1.06$. Independent sample t-tests revealed that the TD group was more accurate than the DLD group in using present tense: $t(14.87) = -3.49, p < .0125, d = 1.27$ and past tense: $t(44) = -3.36, p < .0125, d = 1.07$.

Furthermore, we examined whether the production accuracy of present tense verbs varied based on whether the prefix was stressed or not. Children with DLD used present tense verbs with a stressed prefix with 73.33% accuracy ($SD = 29.12$). This was slightly higher than their accuracy of producing verbs with unstressed prefixes which was 67.13% ($SD = 22.57$). However, this difference was not statistically significant ($t(13) = -1.41, p = .18, d = .38$).

Table 3. Mean Percentages correct (with standard deviations) of the TD and DLD groups for the target morphemes

	Group	
	TD N=32	DLD N=14
Overall accuracy	94.64 (9.06)	77.14 (15.71)***
Tense accuracy	96.09 (6.51)	81.42 (14.93)**
<i>Present tense</i>	94.06 (9.94)	70.24 (24.72)**
<i>Past tense</i>	98.13 (4.47)	92.38 (6.97)**
Agreement accuracy	97.34 (4.86)	85.12 (12.75)*
Gender agreement	98.96 (2.15)	93.10 (7.33)*
<i>Masculine agreement</i>	100.00 (0)	97.32 (4.72)
<i>Feminine agreement</i>	97.77 (4.6)	88.27 (12.09)**
Number agreement	98.7 (4.55)	95.36 (7.11)**
<i>Singular agreement</i>	100.00 (0)	98.81 (2.48)
<i>Plural agreement</i>	97.40 (6.21)	91.91 (8.54)
Person agreement <i>3rd person</i>	99.06 (2.71)	92.14 (10.55)**

Note. TD = Typically Developing. DLD = Developmental Language Disorder.
* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Subject-verb agreement accuracy

A composite percentage score of subject-verb agreement was calculated for number, gender, and person. Subject-verb agreement accuracy scores were analyzed using a 2 x 2 mixed-design ANOVA with group as a between-subject factor (2 levels: DLD and TD) and verb tense as a within-subject factor (2 levels: past and present). There was a main effect of group [$F(1, 44) =$

22.5, $p < .05$, $\eta^2 = .33$]. The main effect of tense was non-significant, but the interaction between tense and group was significant [$F(1, 44) = 8.39$, $p < .001$, $\eta^2 = .16$]. Based on simple effects analysis, the TD group marked subject-verb agreement at a similar level of accuracy for past tense ($M = 97.4\%$, $SD = 5.53$) and present tense ($M = 97.29\%$, $SD = 6.07$, $t(31) = .09$, $p = .923$, $d = .01$). The DLD group presented a different pattern, showing higher accuracy in marking subject-verb agreement in past tense verbs ($M = 97.92\%$, $SD = 6.07$) compared to present tense verbs ($M = 89.52\%$, $SD = 9.41$): $t(13) = 2.36$, $p < .05$, $d = .62$. Furthermore, the TD group was significantly more accurate than the DLD group in marking subject-verb agreement in present tense verbs: $t(14.87) = -3.49$, $p < .0125$, $d = 1.27$, but not in past tense verbs: $t(17.07) = -2.92$, $p = .02$, $d = 1.0$.

Subject-verb agreement: gender agreement accuracy

This analysis was only conducted for singular verbs as gender in verbs that end with the plural morpheme *-u* is used regardless of the gender of the subject in PA. Gender agreement accuracy scores were analyzed using a 2 x 2 x 2 mixed-design ANOVA with group as a between-subject factor (2 levels: DLD and TD), verb tense (2 levels: past and present) and gender category (2 levels: masculine and feminine) as within-subject factors. There were significant main effects of group [$F(1, 44) = 17.36$, $p < .001$, $\eta^2 = .28$] and gender [$F(1, 44) = 18.52$, $p < .001$, $\eta^2 = .3$]. The group by gender interaction was significant [$F(1, 44) = 9.83$, $p < .01$, $\eta^2 = .18$].

The TD group showed higher accuracy in marking masculine verbs relative to feminine verbs: $t(31) = -2.74$, $p < .01$, $d = .49$). The same was observed in the DLD group: $t(13) = -3.31$, $p < .0125$, $d = .88$. The TD group and DLD group did not differ significantly in their production accuracy of masculine verbs: $t(13) = -2.12$, $p = .06$, $d = .84$). Yet, the DLD group was significantly less accurate than the TD group in using feminine verbs: $t(14.68) = -2.85$, $p <$

.0125, $d = 1.04$). There were no significant interactions between group and tense, gender and tense, and group, gender, and tense.

Further analysis was conducted for the DLD group to examine whether the production accuracy of the present tense feminine prefix was affected by stress assignment. The DLD group produced present tense verbs with a stressed prefix ($M = 78.57\%$, $SD = 32.31$) with significantly higher accuracy than the same forms but with unstressed prefix: $M = 61.43\%$, $SD = 29.83$, $t(13) = -2.28$, $p < .05$, $d = .61$.

Subject-verb agreement: number agreement accuracy

The number agreement accuracy scores were analyzed with a 2 x 2 x 2 mixed-design ANOVA with group as a between-subject factor (2 levels: DLD and TD), verb tense (2 levels: past and present) and number category (2 levels: singular and plural) as within-subject factors. There were significant main effects of group [$F(1, 44) = 7.36$, $p < .01$, $\eta^2 = .14$] and number [$F(1, 44) = 16.76$, $p < .001$, $\eta^2 = .28$]. The group by number interaction was significant [$F(1, 44) = 4.29$, $p < .05$, $\eta^2 = .11$]. Simple effects analysis revealed that the TD group did not differ in the accuracy of marking singular and plural verbs: $t(31) = -2.37$, $p < .0125$, $d = .42$. In contrast, the DLD group was significantly less accurate in marking plural verbs compared to singular verbs: $t(13) = -3.64$, $p < .0125$, $d = .97$. The TD and DLD groups were not significantly different in their accuracy of marking singular verbs: $t(13) = -1.79$, $p = .094$, $d = .6$ or plural verb forms: $t(19.26) = -2.44$, $p = .044$, $d = .74$. There were no significant interactions between group and tense, number and tense, and group, number, and tense.

Subject-verb agreement: person agreement accuracy

Person agreement score was based on the accuracy of marking verbs in 3rd person and were analyzed with a 2x2 mixed-design ANOVA with group as a between-subject factor (2 levels: DLD and TD), verb tense (2 levels: past and present) as within-subject factor. There was a

main significant effect of group [$F(1, 44) = 12.26, p < .001, \eta^2 = 0.22$], with the TD group outperforming the DLD group in person agreement accuracy. There was a main effect of tense [$F(1, 44) = 7.53, p < .05, \eta^2 = 0.15$]. In general, marking 3rd person in past tense verbs ($M = 98.62\%$, $SD = 3.34\%$) was easier than marking present tense verbs ($M = 95.29$, $SD = 11.06$). The group by tense interaction was not significant [$F(1, 44) = 2.72, p = .08, \eta^2 = 0.02$].

Analysis 2: Error patterns in verb tense and agreement marking

Tense

We compared DLD and TD children on the type and frequency of the forms they used in place of the target tense. The frequency of tense substitutes in the DLD group was almost as twice as that of the TD group (see Table 4). The tense substitutes were either finite forms or non-finite/tenseless forms. Finite substitutes involved the use of the incorrect tense (e.g., past tense for present tense). The non-finite substitutes involved the use of the imperfective bare verb and the imperative in place of the target tense.

The imperfective bare verb was most commonly used as a substitute for present tense by the DLD group, followed by the imperative and incorrect tense (e.g., past for present). Similarly, the most common present tense substitute in the TD group was the use of imperfective followed by the imperative and incorrect tense. The frequency of present tense substitutes significantly differed between groups ($\chi^2(2, N=201) = 7.05, p < .05$).

The DLD group used the imperative and the present tense as substitutes for past tense verbs. In rare occasions, they used the imperfective bare verb. On the other hand, the TD group predominantly used the imperfective verb as a default form for past tense, followed by the use of present tense. The TD group rarely used the imperative as a default form in place of past tense. The frequency of past tense substitutes significantly differed between the TD and DLD groups ($\chi^2(2, N = 54) = 10.56, p < .001$).

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Table 4. *Frequency of tense substitutes*

Target	Substitute type		Group	
			TD	DLD
			<i>N</i>	<i>N</i>
Present tense	Non-finite	<i>Imperative</i>	15	51
		<i>Imperfective</i>	42	59
	Finite	<i>Past tense</i>	15	19
	Total		72	129
Past tense	Non-finite	<i>Imperative</i>	3	15
		<i>Imperfective</i>	10	4
	Finite	<i>Present tense</i>	7	15
	Total		20	34

Note. **TD** = Typically Developing. **DLD** = Developmental Language Disorder.

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Subject-verb agreement

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For present tense verbs, the frequency of agreement errors in the DLD group was four times that of the TD group (see Table 5). Inspection of the data in Table 5 reveals that some of the agreement errors were associated with tense errors. The majority of the agreement errors were related to the use of the imperative verb and affected person agreement only. The omission of

576 the prefix *byi-* often resulted in the 3rd person present tense verb being substituted by the 2nd
577 person imperative verb (tense and person errors). This type of error barely occurred in the TD
578 group. There were few instances where gender and/or number were also affected. An example
579 of this was the use of the 2nd person masculine imperative instead of 3rd person feminine
580 present tense (tense, person and gender errors).

581 There were also agreement errors that occurred despite using the correct tense. The majority
582 of errors in the TD and DLD groups affected the 3rd person plural present tense. Correct
583 agreement for this form requires the use of the circumfix (e.g. *byi—u* in *byidrusu* “they are
584 studying”). In both groups, it was noted that the plural morpheme *-u* was omitted which resulted
585 in the 3rd person singular verb (number agreement error). The 3rd person feminine singular
586 present tense form had the second-highest rate of errors in both groups. In both groups, this
587 form was substituted by its masculine counterpart (gender agreement error).

588 In general, the frequency of errors that affected past tense production was lower than present
589 tense production. As seen in Table 6, some of the agreement errors in past tense were associated
590 with tense errors. The majority of these errors were associated with the imperative and only
591 affected person agreement. For instance, when the 3rd person plural past tense was replaced
592 with the 2nd person plural imperative (person and tense error). In a few occurrences, gender
593 agreement was also affected. An example of this was the use of the 2nd masculine imperative
594 in place of third person feminine past tense (tense, person and gender errors).

595 When past tense was used correctly, the majority of agreement errors affected 3rd person
596 plural past tense. Both the TD and DLD group showed omissions of the plural suffix *-u* which
597 resulted in the 3rd person singular past tense as a substitute (number error). The 3rd person
598 feminine past tense had the second-highest number of errors in both groups. The omission of
599 the feminine suffix *-at* resulted in the 3rd person masculine as a substitute (gender error).

Table 5. Frequency of Subject-verb agreement errors in present tense verbs

		TD			DLD		
		Target forms			Target forms		
Actual productions		PRES-3MS <i>b-yi-drus</i>	PRES-3FS <i>b-ti-drus</i>	PRES-3P <i>b-yi-drusu</i>	PRES-3MS <i>b-yi-drus</i>	PRES-3FS <i>b-ti-drus</i>	PRES-3P <i>b-yi-drus-u</i>
Non-finite forms	IMPR-2FS <i>ʔidrusi</i>		3			8	2
	IMPR-2MS <i>ʔidrur</i>	4	2	6	15	2	2
	IMPR-2P <i>ʔi-drus-u</i>						23
	IMPF-3MS <i>yi-drus</i>					1	
	IMPF-3FS <i>ti-drus</i>				3		
Incorrect tense	IMPF-3P <i>ti-drusu</i>					1	
	PAST-3MS <i>daras</i>			1		3	1
	PAST-3FS <i>dars-at</i>						1
	PRES-3MS <i>b-yi-drus</i>		1	5		5	13
Correct tense	PRES-3FS <i>b-ti-drus</i>			3			0
	Total	4	6	15	18	20	42

Note. TD = Typically Developing. DLD = Developmental Language Disorder. PRES-3MS = present 3rd person masculine singular. PRES-3FS = present 3rd person feminine singular. PRES-3P = present 3rd person plural. IMPR-2FS = Imperative 2nd person feminine singular. IMPR-2MS = Imperative 2nd person masculine singular. IMPR-2P = Imperative 2nd person plural. IMPF-3MS = imperfective 3rd person masculine singular. IMPF-3FS = imperfective 3rd person feminine singular. IMPF-3P = imperfective 3rd person plural. PAST-3MS = past 3rd person masculine singular. PAST-3FS = past 3rd person feminine singular.

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Table 6. *Frequency of Subject-verb agreement errors in past tense verbs*

		TD			DLD		
		Target forms			Target forms		
		PAST-3MS <i>daras</i>	PAST-3FS <i>dars-at</i>	PAST-3P <i>daras-u</i>	PAST-3MS <i>daras</i>	PAST-3FS <i>dars-at</i>	PAST-3P <i>daras-u</i>
Actual productions							
Non-finite forms	IMPR-2MS <i>ʔi-drus</i>	2	3		3	2	
	IMPR-2FS <i>ʔi-drus-i</i>		1			4	
	IMPR-2P <i>ʔ-idrus-u</i>			1			5
	IMPF-3MS <i>yi-drus</i>					1	
Incorrect tense	PRES-3MS <i>b-yi-drus</i>		1			1	2
Correct tense	PAST-3MS <i>daras</i>		2	12		5	8
	PAST-3FS <i>dars-at</i>			3	1		5
	PAST-3P <i>daras-u</i>				1		
Total		2	7	16	5	13	20

Note. TD = Typically Developing. DLD = Developmental Language Disorder. PAST-3MS = past 3rd person masculine singular. PAST-3FS = past 3rd person feminine singular. PAST-3P = past 3rd person plural. IMPR-2MS = Imperative 2nd person masculine singular. IMPR-2FS = Imperative 2nd person feminine singular. IMPR-2P = Imperative 2nd person plural. IMPF-3MS = imperfective 3rd person masculine singular. IMPF-3FS = imperfective 3rd person feminine singular.

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Discussion

This study examined verb morphology production in Palestinian Arabic-speaking children with Developmental Language Disorder (DLD) and their typically developing peers (TD). Using a novel verb production task, we aimed to compare children with and without DLD in terms of their (1) accuracy rates and (2) error patterns of marking tense and subject-verb agreement.

The production accuracy of verb tense and agreement marking

As predicted, there was a significant difference between children with and without DLD in the percentage of correct use of tense and subject-verb agreement verb inflections, with the DLD group scoring significantly lower than the TD group on the verb elicitation task. This suggests that PA-speaking children with DLD have difficulties in using verbal tense and agreement forms. These findings corroborate the well-documented evidence that verb morphology production is an area of vulnerability for children with DLD acquiring Arabic (Abdallah & Crago, 2008; Morsi, 2009; Fahim, 2017), just as it is for other languages, such as English (e.g., Rice & Wexler, 1996), German (e.g., Rothweiler, Chilla & Clahsen, 2012); Swedish (e.g., Hansson & Leonard, 2003), Hebrew (e.g., Leonard & Dromi, 1994) and Italian (e.g., Bortolini et al., 1997).

Overall, the percentage of correct tense marking in the DLD group (82%) was significantly lower than in the TD group. When the accuracy scores of the groups for both tense forms were contrasted, a remarkable pattern emerged. Despite significant group differences, TD children and children with DLD produced past tense verbs with a high level of accuracy, scoring 98% and 92%, respectively. Conversely, the DLD group had significant difficulties with their use of present tense, with a mean accuracy of 70%. The specific difficulty with present tense production was reported previously for Arabic-speaking children with DLD (e.g., Abdallah and Crago, 2008; Morsi, 2009) and it is unlike other languages where a considerable body of

research has reported greater difficulties with the past tense, as in English (e.g., Rice & Wexler, 1996). A possible factor for differences in which tense forms are affected in different languages is structural complexity. For example, a higher number of errors exhibited by Hebrew-speaking children with DLD in using past tense relative to present tense has been attributed to the higher number of agreement features required for the past inflection (Dromi et al., 1999). Following this view, in PA, the past tense form is less marked, structurally simpler than the present tense (as discussed in the Introduction). For example, the verb *daras* “he studied”, is formed by combining the vocalic pattern *a-a* with the root *d-r-s* (there is no overt marking of tense), whereas the present form *byidrus* “he is studying” entails the insertion of a vocalic pattern *-u-* plus the addition of a prefix *byi-*, where the prefix *b-* indicates present tense.

In terms of subject-verb agreement, children with DLD produced 85% of the verbs with the correct agreement for all categories, and this was significantly lower than the TD group who showed an almost ceiling effect, with their agreement accuracy being 97%. Interestingly, the overall accuracy for marking agreement in the DLD group was higher than for marking tense. This suggests that marking of tense was more problematic than marking subject-verb agreement for our sample. Abdallah and Crago (2008) who also reported that preschool-age, Hijazi Arabic-speaking children had higher accuracy scores in marking subject-verb agreement (77%) compared to tense (68%).

Difficulty with subject-verb agreement is not surprising as the subject and verb must agree on several grammatical categories including person, number and gender. Furthermore, agreement in PA is fusional, where more than one agreement category is denoted by a single inflection. For example, the suffix *-at* in *darsat* “she studied” denotes 3rd person, feminine gender and singular number simultaneously. In other instance, agreement categories denoted by a circumfix affix, where a prefix and suffix are required. An example of this is the circumfix *byi—u* in *byidrusu* where it indicates 3rd person plural agreement (no gender distinction).

Having to express more than one agreement category simultaneously using less transparent morphemes could be contributing factors in making these forms more challenging (Dromi et al., 1999).

Examination of gender agreement marking revealed that the DLD group was similar to the TD group in producing masculine verb forms but were less accurate in producing feminine verb forms. Several factors could explain the greater difficulty with marking feminine agreement observed in the DLD group. This pattern was also found in Hijazi- Arabic speaking children with DLD (Abdallah & Crago, 2008). First, in the typical acquisition of Arabic, masculine verb forms are acquired earlier than feminine verb forms, both in production (Aljenaie, 2000) and comprehension (Al-Akeel, 1998). Furthermore, masculine verb forms are less marked compared to feminine forms (e.g., *daras* “he studied” versus *darsat* “she studied”).

Looking at number agreement marking, the DLD group was similar to the TD group in producing singular and plural verbs. However, the DLD group was less accurate in their use of plural verbs compared to singular verbs. This can be attributed to the order in which these forms appear in typical development. Singular verb forms are acquired earlier than plural verb forms, both in production (Abdu & Abdu, 1986; Aljenaie, 2001; Basaffar & Safi, 2012; Omar, 1973) and comprehension (Al-Akeel, 1998; Moawad, 2006). Moreover, singular number agreement is unmarked any overt inflections in present and past tense verbs whereas plural number agreement is by the suffix *-u* (e.g., *daras* “he studied” versus *darasu* “ they studied”).

In regards to person agreement, though there were significant differences between the TD and DLD groups, both groups marked 3rd person agreement with more than 90% of accuracy. This high level of accuracy can be attributed to the fact that 3rd person verbs are the first to emerge in the language of TD children acquiring Arabic (Abdu & Abdu, 1986; Aljenaie, 2001; Basaffar & Safi, 2012). Our findings are in contrast to the findings of Abdallah and Crago (2008) who reported that Hijazi-Arabic speaking children with DLD had a difficulty with

680 person agreement as they produced 3rd person verbs with 66% of accuracy (compared to 92%
681 in our study). This difference can be attributed to age differences: in our study the mean age of
682 the DLD group was 66 months with the oldest child being 94 months) whereas in Abdallah and
683 Crago (2008)'s study, the mean age of the DLD group was 57 months with the oldest child
684 being 63 months).

685 An interesting observation emerged regarding stressed and unstressed affixes (for a
686 description of stress patterns in PA, see Watson, 2011). Despite the lack of significant statistical
687 differences, the DLD group produced present tense verbs with the stressed prefix more
688 accurately than verbs with the unstressed prefix. Looking specifically at the present tense
689 feminine inflection *bti-* and its allomorph *bit-*, the DLD group used present tense feminine
690 verbs with a stressed prefix with 79% of accuracy compared to 61% of accuracy for verbs with
691 an unstressed prefix. This discrepancy could possibly be attributed to the lower acoustic
692 salience unstressed prefixes.

693 Furthermore, the past tense feminine agreement morpheme *-at* as in '*dar.sat*' "*she studied*"
694 was challenging for the DLD group in our study. This inflection occurs at the end of the word
695 as part of an unstressed syllable, making the suffix *-at* more likely to be missed by children
696 with DLD possibly due to its lower acoustic salience. This suffix was often omitted from the
697 past feminine verb forms resulting in a masculine verb *da.ras* "he studied". The plural
698 inflection *-u* as in '*da.ra.su*' "they studied" was not problematic for the DLD group. The plural
699 inflection always occurs in a final unstressed syllable (Watson, 2011), which would have lower
700 acoustic salience relative to the other syllables in the verb. Stressed syllables are typically
701 louder and longer making them have a high perceptual salience. Although the accuracy of using
702 inflections was higher when they were stressed compared to being unstressed, the scores of the
703 DLD group on the stressed inflections were relatively low. This suggests that, even though
704 children with DLD may have difficulties in perceiving morphemes of low acoustic saliency,

this is unlikely to be the only factor that underpins their difficulties with verb morphology production and further research is needed to address this issue.

Error patterns in verb morphology production

Qualitative analysis revealed that the target tense forms were substituted by either finite forms (incorrect tense) or non-finite/tenseless forms (imperative and the imperfective bare verb). Interestingly, the TD and DLD groups appear to display the same tense substitution patterns, but they differ in the frequency of their use. As predicted, the most frequent tense substitution patterns in the DLD group were the use of the imperative as well the imperfective bare verb. These two non-finite forms occurred with equal frequency. On the other hand, the use of the imperfective bare was the most common substitute noted in the TD group, whereas the imperative was used less frequently in this group. The use of incorrect tense (e.g., past for present tense) was the least occurring tense error in both groups.

A considerable body of research has shown that the verb morphology error patterns displayed by children with DLD are similar to those observed in younger TD children acquiring the same language (Leonard, 2014). In fact, according to the *Extended Optional Infinitive (EOI)* (e.g., Rice & Wexler, 1996; Rice, Wexler, & Cleave, 1995), children with and without DLD go through an *OI* stage in which they treat marking of tense and agreement as being optional in obligatory contexts (e.g., Rice & Wexler, 1996). For example, English and German-speaking children with DLD tend to use infinitives or bare stem forms instead of the target tense (Rice & Wexler, 1996). Arabic has no infinitive forms. Yet, a stage similar to *OI* seems to exist in this language. Children with and without DLD in our study used the imperative and imperfective bare verb forms instead of target tense. The use of the imperative has been observed in the language of TD toddlers acquiring Yemini Arabic (Qasem & Sircar, 2017), Egyptian Arabic (Fahim, 2017; Omar, 1973) and Kuwaiti Arabic (Aljenaie, 2001) as well as children with DLD acquiring Hijazi Arabic (Abdallah & Crago, 2008) and Egyptian Arabic

(Fahim, 2017; Morsi, 2009). The imperfective bare stem has been observed in the language of TD children acquiring Kuwaiti Arabic (Aljenaie, 2010) and children with and without DLD acquiring Egyptian Arabic (Fahim, 2017). In accordance with *EOI*, the use of the imperative and the imperfective bare verb forms as default forms is extended for a longer period in Arabic-speaking children with DLD. Both of these forms are described as being non-finite (Aljenaie, 2010) or tenseless (Benmamoun 1999, 2000). Children with and without DLD in our study also used finite forms instead of the target. Our findings thus emphasize that the typology of a language impacts both on the type of structures affected by DLD and on the type of errors that characterize the disorder. Our findings also expand on Paradis and Crago's (2004) proposal that the term “default form” refers to the optional use of either non-finite or finite forms instead of target tense, which is observed in children with and without DLD.

A closer look at the types of errors in subject-verb agreement reveals an interesting pattern. The use of the masculine verb instead of the feminine verb was the most dominant gender agreement error in the DLD and TD groups. The error involved the omission of the suffix *-at* of past tense feminine verbs, or the prefix *biti-* /*bit-* of present tense feminine verbs. This type of error has been reported to Arabic-speaking children with typical language development (Aljenaie, 2001, 2010; Omar, 1973) and with DLD (Abdallah, 2002; Abdallah & Crago, 2008; Fahim, 2005).

For the TD and DLD groups, the most dominant number agreement error was the omission of the plural suffix *-u* of the past tense, or the suffix *-u* of the circumfix *byi-u* in the present tense verb. This pattern was observed in the TD and DLD groups. This omission error resulted in the unmarked singular verb being a substitute of the marked plural verb. The use of singular verbs in place of plural verbs has also been documented in Arabic speaking children with and without DLD (Abdallah, 2002; Abdallah & Crago, 2008; Aljenaie, 2001, 2010; Omar, 1973). It can be seen that, in line with our prediction, gender and number agreement errors involved

the use of the unmarked form instead of the marked form. In this case, the unmarked masculine and singular verbs were used instead of the marked feminine and plural verbs, respectively. This pattern has been also reported for Kuwaiti Arabic-speaking TD children (Aljenaie, 2001, 2010) and Hijazi Arabic-speaking children with DLD (Abdallah & Crago, 2008). These findings are in support of Omar (1973)'s suggestion that the third masculine singular may be the default verbal agreement form in Arabic.

We only examined the subject-verb agreement for 3rd person verbs. Person agreement errors were primarily associated with tense errors. This occurred in cases where the imperative was used instead of the target tense. This pattern differs from the findings of Abdallah & Crago (2008) who documented that Hijazi Arabic-speaking children with DLD used 1st person verbs in place of 3rd person verbs. The pattern also differs from studies reporting that the 3rd person verbs emerge earlier than 2nd person verbs (Abdu & Abdu, 1986; Aljenaie, 2001, 2010; Basaffar & Safi, 2012). In the DLD group, the imperative was mostly used instead of present tense verbs ($N = 51$) and much less frequently in place of past tense verbs ($N = 15$). Third person agreement is realized by the prefix of the present tense verb or the suffix of the past tense verb, whereas, the imperative 2nd person agreement is unmarked by any affixes. Therefore, it appears person agreement errors represent the use of the unmarked 2nd person imperative instead of the marked 3rd person present/past tense verb. Based on the current data and the test items, it is difficult to determine whether the difficulty is in marking tense or person agreement. To determine this, an additional examination of 1st and 2nd person verb production is needed.

It is important to note that Abdallah and Crago (2008) reported that when Hijazi Arabic-speaking children with and without DLD made tense or agreement errors, the inaccurate production differed from the target verb by one feature only. Inspection of our data reveals a similar pattern. Apart from the use of the imperative (tense and person error), the majority of errant productions of the TD and DLD groups differed from the target by one feature. These

errors are referred to as being "near misses" and have been documented in richly inflected languages such as Hebrew and Spanish (for a review, see Leonard, 2014). Another important observation is that most errors in the TD and DLD groups were made in forms in which agreement is realized by a circumfix morpheme. In our study, this form was the 3rd plural present tense verb in which tense, person and number agreement are expressed by the circumfix *byi--u*. The children in our study treated the circumfix affixes as separate units. The most common error was the omission of the prefix *byi-* while retaining the suffix *-u*. A similar pattern was noted in Kuwaiti Arabic in which the 3rd plural present tense verb is expressed with the circumfix *yi--oon*. Aljenaie (2001) found that the TD Kuwaiti Arabic-speaking children tended to omit the prefix *yi-* and maintain the suffix *-oon*. The second error pattern in our study involved omission of the plural suffix *-u* while retaining the prefix, and this pattern was documented in Hijazi Arabic-speaking children with DLD (Abdallah & Crago, 2008) and was also observed in TD Kuwaiti Arabic-speaking children (Aljenaie, 2010).

Clinical implications

Given the lack of standardized Arabic assessments for PA, the diagnosis of DLD is based on informal evaluation procedures that are combined with subjective clinical judgments, which may lead to variations and inconsistencies across speech and language therapists (SLTs) as to which structures are targeted in the assessment of DLD. The results of our study provide SLTs with a description of specific verb morphology difficulties in Arabic-speaking children with DLD. Significant differences between children with DLD and TD controls were found in using present tense and verbs with feminine inflections. The findings indicate that SLTs should consider targeting these structures in the assessment and intervention of PA children with DLD.

Limitations

One of the limitations was the small sample size of the DLD group. This is due to the limited number of clinics in [REMOVED FOR REVIEW] from which this group was recruited. Future

studies are recommended to include larger sample sizes. The study provides results about the deficits of verb morphology production only and no data on children's comprehension of verb morphology. To achieve a full understanding of the underlying mechanisms of DLD, other aspects of verb morphology should be examined. These should include comprehension and grammaticality judgment tasks, tasks investigating 1st and 2nd person morphemes and tasks which target derivational as well as inflectional morphology.

Conclusion

The findings show that Palestinian Arabic-speaking children with DLD present with deficits in the production of verb morphology relative to typically developing children. Inflected verbs with increased markedness including present tense and feminine verb form were more challenging for the DLD group than past tense, masculine verb forms, respectively. For the TD and DLD groups, the most frequent tense and agreement error patterns included omissions of the target morphemes. The omission of target morphemes often resulted in the children producing structurally simpler (less marked) verb forms instead of marked verb forms. And although it seemed that the DLD group was more accurate with some stressed than unstressed forms, the scores of the DLD group were still lower than the TD group. Future studies would need to include larger sample sizes to increase statistical power and generalizability of the findings, investigate other aspects of verb morphology, including both production and comprehension consider other language domains, such as syntax, phonology and semantics and employ longitudinal designs to provide more in-depth knowledge of Arabic language acquisition.

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APPENDIX 1

Individual raw scores of the background measures and the verb elicitation task for the TD and DLD groups

subject	gender	age	<i>MPU</i>	<i>CL-NWR</i> (score out of 30)	<i>CPM</i> (score out of 36)	% of correct verbs
DLD1	M	67	2.88	17	20	55
DLD2	M	69	3.14	19	21	70
DLD3	F	84	4.06	16	23	60
DLD4	F	85	4.1	12	20	51
DLD5	M	52	3.21	13	12	90
DLD6	M	58	3.12	10	18	65
DLD7	M	50	2.62	11	11	68
DLD8	M	94	6.27	23	19	91
DLD9	M	54	3.22	16	12	88
DLD10	M	48	2.19	9	10	78
DLD11	F	56	3.21	16	12	86
DLD12	M	66	4.98	18	16	96
DLD13	M	61	3.36	21	9	100
DLD14	F	89	3.77	17	14	78
TD1	M	57	6.47	30	19	100
TD2	M	59	5.21	30	14	98
TD3	M	71	4.19	30	18	100
TD4	F	75	5.46	30	16	100
TD5	F	42	2.97	19	8	91
TD6	M	60	5.1	30	17	100
TD7	F	66	5.26	29	21	100
TD8	F	56	3.46	28	18	96
TD9	F	84	6.31	30	21	100
TD10	F	54	3.93	30	14	93
TD11	F	56	5.11	28	15	96
TD12	F	36	2.41	16	NA	65
TD13	M	83	5.89	30	22	100
TD14	F	54	4.9	27	17	98
TD15	M	48	3.93	24	15	96
TD16	M	85	6.01	30	21	100
TD17	M	80	5.68	30	15	100
TD18	M	79	5.13	30	19	98
TD19	M	68	4.88	29	19	98
TD20	F	51	3.79	27	14	98
TD21	M	65	3.92	25	21	98
TD22	M	96	7.61	30	23	100
TD23	M	87	6.58	30	20	100

TD24	M	41	2.83	19	9	80
TD25	M	90	7.24	30	20	100
TD26	M	73	5.96	30	18	100
TD27	F	39	3.87	19	NA	73
TD28	F	43	4.21	21	8	80
TD29	F	47	4.53	25	10	91
TD30	M	49	4.69	23	15	95
TD31	M	43	3.91	20	10	78
TD32	M	55	5.45	30	23	100

Note. **MPU** = Mean Morpheme per Utterance. **CI-NWR** = Crosslinguistic Non-word Repetition. **CPM** = Colored Progressive Matrices.

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APPENDIX 2

List of verbs used in the verb elicitation task

Pair	Number Agreement	Gender Agreement	Present (A)	Tense	Past (B)
Practice items			A. bit.qat ^ʕ .tʕiʕ* cut -PRES-3FS		A. qat ^ʕ . tʕa. ʕat cut -PAST-3FS
			B. byir.bu.tʕu tie -PAST-3P		B. ra.ba.tʕu tie -PAST-3P
1.	Singular	Masculine	1. biyo:.kil eat -PRES-3MS		1. ʔa.kal eat -PAST-3MS
2.			2. byif.rab drink -PRES-3MS		2. ʃi.rib drink -PAST-3MS
3.			3. byi.yas.sil wash -PRES-3MS		3. yas.sal wash -PAST-3MS
4.			4. biy.maʃ.ʃit brush -PRES-3MS		4. maʃ.fat brush -PAST-3MS
5.			5. byir.sum draw -PRES-3MS		5. ra.sam draw -PAST-3MS
6.			6. byi.law.win paint -PRES-3MS		6. law.wan paint -PAST-3MS
7.			7. byi.yib.ri sharpen - PRES-3MS		7. ba.ra sharpen - PAST-3MS
8.			8. byif.tah open -PRES-3MS		8. fa.tah pray -PAST-3MS
9.			9. bit.far.ʃi brush -PRES-3FS		9. far.ʃat brush -PAST-3MS
10.	Singular	Feminine	10. btik.tub write -PRES-3FS		10. kat.bat write -PAST-3FS
11.			11. bit.qus ^ʕ cut - PRES-3FS		11. qas ^ʕ .s ^ʕ .at cut -PAST-3FS
12.			12. bit.naʃ.ʃif dry -PRES-3FS		12. naʃ.ʃa.fat dry -PAST-3FS
13.			13. bitʃ.rab drink - PRES-3FS		13. ʃir.bit drink -PAST-3FS
14.			14. btaʃ.tʕi: give - PRES-3FS		14. aʃ.tʕat give -PAST-3FS
15.			15. bit.taʃ.mi feed - PRES-3FS		15. taʃ.mat feed -PAST-3FS
16.			16. byil.bi.su wear -PRES-3PL		16. lib.su wear -PAST-3PL
17.			17. byi.nad ^ʕ .fu clean -PRES-3PL		17. nad.dʕa.fu clean -PAST-3PL

18.		18. <u>bi</u> .ra.bu drink -PRES-3PL	18. <u>f</u> ir.bu drink -PAST-3PL
19.		19. byi. <u>law</u> .nu paint -PRES-3PL	19. <u>law</u> .wa.nu paint -PAST-3PL
20.		20. <u>byi</u> k.tu.bu write -PRES-3PL	20. <u>ka</u> .ta.bu write -PAST-3PL
21.		21. <u>byi</u> n.fu.χu blow -PRES-3PL	21. <u>na</u> .fa.χu blow -PAST-3PL
22.		22. <u>byi</u> l.ʃa.bu play -PRES-3PL	22. liʃ.bu play -PAST-3PL
23.		23. <u>bi</u> n.ʃu.ru hang -PRES-3PL	23. <u>na</u> .ʃa.ru hang -PAST-3PL
24.	Plural	24. <u>byi</u> f.ta.ħu open -PRES-3PL	24. <u>fa</u> .ta.ħu open -PAST-3PL
25.		25. byi. <u>ma</u> f.tu brush -PRES-3PL	25. <u>ma</u> f.ʃa.tu brush -PAST-3PL
26.		26. byi. <u>far</u> .ʃu brush -PRES-3PL	26. <u>far</u> .ʃu brush -PAST-3PL
27.		27. <u>byi</u> r.bu.tu tie -PRES-3PL	27. <u>ra</u> .ba.tu tie -PAST-3PL
28.		28. byi. <u>na</u> f.fu dry -PRES-3PL	28. <u>na</u> f.ʃa.fu dry -PAST-3PL
29.		29. byi. <u>qas</u> ^ʃ .s ^ʃ u cut -PRES-3PL	29. <u>qas</u> ^ʃ .s ^ʃ u cut -PAST-3PL
30.		30. <u>byi</u> f.la.ħu takeoff -PRES-3PL	30. <u>ʃi</u> l.ħu takeoff -PAST-3PL

Note. PRES-3MS = present 3rd person masculine singular. PAST-3MS= past 3rd person masculine singular. PRES-3FS= present 3rd person feminine singular. PAST-3FS= past 3rd person feminine singular. PRES-3P= present 3rd person plural. PAST-3P= past 3rd person plural.

*underlined syllable are stressed.